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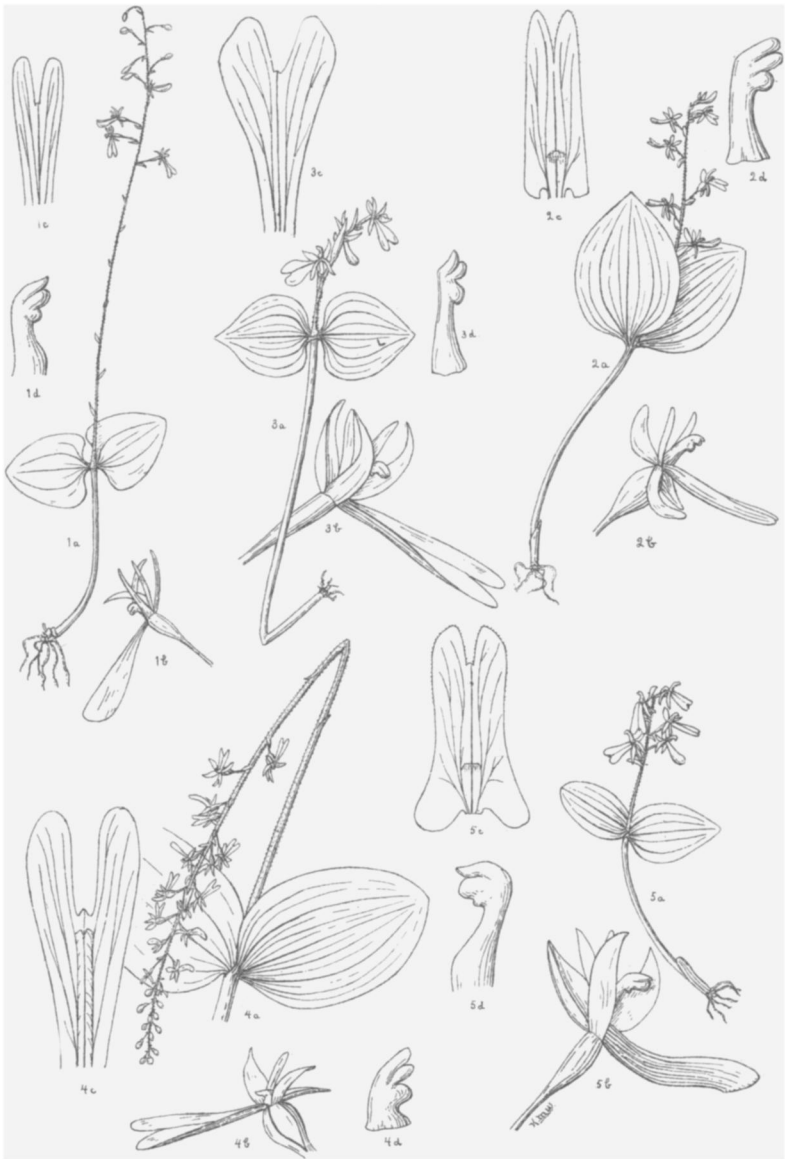
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LISTERA.



LISTERA.

BULLETIN  
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A Revision of the Genus *Listera*

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(PLATES 356, 357)

Few genera of North American plants in which the species are distinct, and hence not difficult to understand, have been so neglected as has the genus *Listera*. During the past few years, however, several new species have been discovered, so that only one remains to be described as new in this paper. Still the known facts are so scattered and some of the species are so little understood that the present paper has been prepared with the attempt to illustrate and describe each species very fully, besides providing an analytical key for easy identification.

The genus has proved to be a very pleasant one upon which to work, owing to the distinct character of the species, and the confusion heretofore existing can be attributed only to the difficulty of recognizing types from the old descriptions. In addition to this the local and restricted distribution of all the species tended to make the solution still more difficult.

Few more interesting examples of the misinterpretation of specific types are encountered than those met with in the treatment by different authors of the western members of the *convallarioides* group. As a result of this, although numerous attempts were made to describe forms which even by the older authors were recognized as clearly distinct, until recently only one species really received a tenable name.

It soon became apparent that a study must be made of the Asiatic and European representatives of the genus before definite conclusions could be reached regarding the nomenclature of the forms found in North America. These results are included here although, owing to the relatively poor facilities for the study of foreign species at the writer's command, they may not be as complete as could be desired.

From a historical standpoint the principal events may be summed up in a very few words. The two European forms were early recognized by Linnaeus, although they were referred to the genus *Ophrys*. Fifty years later *L. convallarioides*, the next species, was described by Swartz from America, and a few years afterward the same one was renamed by Chamisso and Schlechtendal. In 1840 several more species were described by Lindley but, with the exception of several synonyms, only one was American, the rest Asiatic. A Japanese species was discovered by Blume in 1858, and a Chinese species, *L. puberula*, by Maximowicz in 1883. In recent years several new species have been found in America. The first was the *L. borealis* of Morong from the northern Rocky Mountain region. Several years later Small described a new species from the Alleghany mountains; and during the past year a third and still more western species has been separated by Piper. Besides the works of Linnaeus, Willdenow and Lindley no comprehensive monographs of the genus have ever been written, and the species of North America especially have received no detailed treatment.

The genus *Listera*, although widely distributed over the temperate and arctic regions, is nevertheless a small one, and at the present time only about a dozen species are known. Very interesting in this connection is the fact that the individuals of each species are always rare or local, seeming to seek only the most secluded nooks in our damp mossy woods and largest peat bogs.

The most widely distributed of all the species, and at the same time the smallest flowered, is *L. cordata*. It is, moreover, the only one found throughout the temperate zone. First described by Linnaeus under the name *Ophrys*, it was later one of the species upon which Brown founded the genus *Listera*. The characters of the plants are so distinct and constant that but little

confusion has arisen in regard to the type, although there are a few cases of error, the most notable of which were those of Bigelow, who mistook this species for *L. convallarioides*, and of Nuttall in confusing it with *L. australis* then unrecognized. As to the type of this species there can be little doubt.

Another plant closely related to the above is the *L. australis* of the Southern States, which is distinguished principally by the absence of lateral teeth at the base of the lip. By the earlier botanists it was confused with the more northern *L. cordata*, but was early recognized as distinct by Lindley and Hooker. Previously Elliott had confused it with *L. convallarioides*, for which reason Hooker ventured the manuscript name *L. Elliotti*. There is in this species a typical case of the extreme local distribution of many orchids. The main distribution of *L. australis* is along the southern Atlantic coast northward to the Pennsylvania line, but in 1877 Wibbe\* found it in a swamp near the eastern end of Lake Ontario. Since that time it has been found in several other deep sphagnous swamps in the same region. Between these swamps and the next station toward the south lie at least two hundred and fifty miles. The relation of this species to the Oswego flora has been discussed by Professor Rowlee† and needs no further mention here. Dr. Mellichamp‡ thinks that in some cases, at least, *L. australis* may be semi-parasitic on the rootstocks of *Osmunda cinnamomea*. The writer has not had an opportunity to investigate this point.

The *Listera ovata* of Europe is of the *australis* type although quite different in general appearance, and is the largest of all existing species of *Listera*. It was recognized by Linneus but under the generic name *Ophrys*, and later, together with *L. cordata*, formed the basis of Brown's characterization of the genus *Listera*.

The one species of all others which has led to so much confusion is the *Epipactis convallarioides* of Swartz. It is, indeed, true that the original description is quite brief and does not seem to accurately describe any known American plant. There is one, however, with which it agrees better than with the others, and which from

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\* Bull. Torr. Bot. Club, 6: 192. 1877.

† American Naturalist, 31: 798. 1898.

‡ Bull. Torr. Bot. Club, 8: 47. 1881.

the locality must have been the one found by Torner "*e terra nova Am. Sept.*" The leaves are, however, rarely "cordate-subrotund, acute," but the description of the labellum is sufficiently accurate. This species is more widely distributed through North America than others of this group, and is the type of the *L. convallarioides* of most American botanists. As has been shown by Morong\* and Holzinger†, Nuttall's name so often cited for this species is merely a *nomen nudum*, no description being given; and since the first characterization under *Listera* was by Torrey, it follows that the latter should be cited as the author of the name. As will be seen from the synonymy given later in this paper *L. convallarioides* has been by many authors confused with *L. cordata* and *L. australis*. Next to *L. cordata* this species has the widest distribution.

The early botanists of the Northwest, however, found another form, namely, the *L. caurina* of Piper, which, by them, was taken to be the typical *L. convallarioides*. This species is well described and finely figured by Hooker in the Flora Bor. Am. where the illustration of the lip is especially characteristic. Meanwhile the true *L. convallarioides* had been obtained by Chamisso and Schlechtendal from Alaska, and named by them *L. Eschscholtziana*. That this was the case may be inferred from the description which says, leaves orbicular-ovate, ovaries pubescent, column long, lip obcordate, and there is no mention of lateral teeth; besides this there is no other species of this section found in Alaska. Lindley also seems not to have understood the Alaskan species, so that on receiving a specimen of the true *L. convallarioides* from Menzies collected on Banks Island he named it *L. Banksiana*. The original description clearly shows that only this plant could have been in mind.

The next American species was not described until 1893 when some plants collected by Miss Elizabeth Taylor in the Slave River region of Canada were recognized by Dr. Morong as distinct and named by him *L. borealis*. The range of this species has now been extended farther south.

In July, 1897, Small described *L. reniformis* from the southern Alleghanies. This very distinct species had hitherto been entirely overlooked, but unfortunately the name had already been used by

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† Mem. Torr. Bot. Cl., 5: 124. 1894.

\* Contrib. U. S. Nat. Herb. 3: 252. 1895.

Don for an orchid of India. As a substitute for this name *L. Smallii* has been employed in this paper. One of the most interesting facts encountered in the study was the discovery of this species again in eastern Asia. The two regions are as widely separated as can well be imagined, still it will be seen that we have here only an illustration, and a very fine one, of Dr. Gray's observation regarding the relation of the floras of eastern Asia and eastern North America.

The last of the series of American forms to be described was *L. caurina* which Piper recently separated from the *L. convallarioides* as found on the Pacific coast.

Another American species is here recognized for the first time, and has been given the name *L. auriculata*. Only a few specimens have been seen and these were from a very restricted locality. It may be said to be peculiar to the mountainous regions of northern New Hampshire and Maine, but is closely related to the *L. borealis* of the Rocky Mountains.

Of the five species from Eastern Asia, three were described by Lindley, viz., *L. pinetorum*, *L. tenuis* and *L. micrantha*, of which the second seems scarcely distinct from the first. *L. puberula* of Maximowicz is an elegant species from China and now reported also from Japan. *L. Japonica*, also of Japan, was first described by Blume and well figured in his *Orchid. Japon.*

Regarding the relationship and phylogeny of the species little need be said. The usual difficulty was encountered in arranging them in a lineal series, although perhaps in a more marked degree than is usual; consequently a few words of explanation may be necessary to express more clearly the writer's views. It seems probable that the unbifurcated lip and basal leaves of *L. micrantha* represent a primitive condition and perhaps a transition to other genera. Then starting with *L. micrantha* and *L. Japonica* as representing the more primitive type, two divergent lines of development may be traced. Through *L. australis* we pass to *L. ovata*, *L. auriculata* and *L. borealis*, all with oblong lips and without basal teeth. From forms represented by *L. cordata*, although the transition is not quite so clear, have descended through a type similar to *L. Smallii* the reniform-leaved species, *L. puberula* and *L. pinetorum*; and also from the type of *L. Smallii* along another line of development, *L. caurina* and *L. convallarioides*.



The following is a brief synopsis of the species followed by a detailed description of each. Thanks are due Dr. Robinson, of the Gray Herbarium, and Dr. Small, of Columbia University Herbarium, through whose kindness in loaning specimens this work was made possible. Professor Piper and Mr. Fernald have also very kindly loaned a large quantity of material.

### Synopsis of the Species.

Column very short (.5 mm. or less); flowers mostly small; lip not dilated above; leaves, except in one species, deltoid-ovate or reniform.

Lip not 2-cleft, auriculate, acute or acuminate.

Lip weakly bidentate at the base, scarcely longer than the sepals; leaves basal. India. 1. *L. micrantha*.

Lip not bidentate at the base, much longer than the sepals and very narrow; leaves near the middle of the stem. Japan. 2. *L. Japonica*.

Lip 2-cleft or lobed.

Lateral teeth strongly developed, between them a transverse fold; lip not auriculate, lobes linear; raceme glabrous. Europe, Asia, North America. 3. *L. cordata*.

Lateral teeth none; raceme more or less glandular; pedicels glandular; ovaries glabrous.

Leaves ovate; plant small (12-22 cm.); sepals minute; petals recoiled; lip auriculate, lobes almost setaceous, near the base a short transverse and longitudinal fold. Eastern United States. 4. *L. australis*.

Leaves oval; plant large (30-55 cm.); sepals  $\frac{1}{2}$  length of lip, latter not auriculate, lobes oblong, a longitudinal fold on the midrib. Europe. 5. *L. ovata*.

Column of medium length or long (2-3 mm.); flowers larger.

Lip auriculate, oblong, more or less ciliate, a fold between the lateral nerves near the base, no lateral teeth, ovary and pedicels glabrous.

Auricles very small, clasping; leaves large (35-50 mm.), broadly ovate or oval, often acutish; plant of medium size. N. New England and Quebec. 6. *L. auriculata*.

Auricles large (1.5 mm.), divergent; leaves small (12-25 mm.), narrowly ovate, obtuse; plant small (7-15 cm.). Rocky Mountains. 7. *L. borealis*.

Lip not auriculate, dilated above.

Leaves oval, mostly obtuse; pedicels glandular.

Lip sessile, bidentate at the base, small (5 mm.), a papilla at the base of each tooth, abruptly dilated above and retuse, not ciliate; ovary glabrous. Oregon to British Columbia. 8. *L. caurina*.

Lip unguiculate, lateral teeth almost obsolete, larger (9 mm.), papillae none, evenly cuneate, shallowly lobed, ciliate; ovary glandular. North America, trans. cont. 9. *L. convallarioides*.

Leaves ovate-reniform, often acute; pedicels glabrous except in No. 11; ovaries glabrous or nearly so; lip not ciliate, and without folds.

Lip bidentate near the base, sessile, large (9 mm.), very much dilated and deeply lobed. Alleghany Mountains and Japan. 10. *L. Smallii*.

Lip with no basal teeth.

Stems multibracteolate below the raceme; flowers small, lip 7 mm. long, cuneate, deeply lobed, slightly dilated. China and Japan.

11. *L. puberula*.

Stems without bracts; flowers larger, lip 9 mm. long, broadly cuneate and much dilated, rather deeply lobed. India.

12. *L. pinetorum*.

1. *LISTERA MICRANTHA* Lindl. Journ. Linn. Soc. **1**: 176. 1857.

Leaves subrotund-ovate, radical: raceme slender, bracts much shorter than the filiform pedicels: lip ovate, cucullate, scarcely as long as the sepals, at the base furnished with a pair of auricles, the middle lobe very acute and provided on each side with a single minute tooth.

Sikkim Himalayas, alt. 10000 ft.

No specimens of this species have been studied, and the above description was adapted from the original. It seems to be a transitional form connecting this genus with *Neottia*.

2. *LISTERA JAPONICA* Blume, Orchid. Arch. Ind. **136**. 1858.

Slender (10–20 cm. high), stem terete, erect, glabrous below, more or less glandular-pubescent above the leaves; the latter (18–22 mm. long, 15–20 mm. wide) opposite, sessile, spreading, ovate, acute or subacuminate, membranous, obsoletely nervose, glabrous: raceme lax: flowers about 6–9, small, greenish-white: pedicels slender, glandular: ovary  $\frac{1}{2}$  shorter: bracts minute, ovate, obtuse: perianth segments spreading, exterior lanceolate, acute, interior scarcely shorter, linear, rather obtuse: lip (three times the length of the perianth) scarcely stout, at the base cordate-sagittate, clasping the column, 3-nerved, linear-lanceolate, produced above into an elongated, declined, linear, undivided, 1-nerved limb, margins involute: column short, thick, not inclined.

Japan (Kieske). From Nippon Island, locality not indicated. Dr. Savatier (no. 3092) (according to Franchet and Savatier).

Specimens of this species not studied; the above description was adapted from the original by Blume.

3. *LISTERA CORDATA* (L.) R. Br. Ait. Hort. Kew. **5**: 201. 1813.

*Ophrys cordata* L. Sp. Pl. 946. 1753.

*Epipactis cordata* All. Fl. Pedem. **2**: 152. 1785. Willd. Sp.

Pl. Pursh, Fl. Am. Sept.

*Epipactis convallarioides* Bigelow. Fl. Bost. ed. 2, 323. 1824.

*Neottia cordata* Rich. Mem. Mus. Paris **4**: 59. 1818.

*Listera cordata* Torr. Fl. N. U. S., Lindley, Gen. et Sp. Orchid. Hook. Fl. Bor. Am. Ledebour, Flora Ros. Blume, Orchid. Arch. Ind.

Stem very slender (10–18, rarely 28 cm. high), glabrous below, glandular-pubescent just above the leaves but the raceme glabrous; leaves of medium size (12–25 mm. long), inserted at the middle of the stem, broadly ovate, truncate at the base but abruptly contracted at the point of insertion, mucronate: raceme many-flowered, rather dense, very long peduncled: bracts minute (.5 mm. long), broadly ovate, obtuse: flowers very small, on short but slender (2–3 mm. long) ascending, glabrous pedicels which are several times longer than the bract but shorter than the ovary: the broadly ovate sepals and broadly oblong petals both shorter than the ovary (.5 length of the lip), spreading, obtuse: lip very small (4.5 mm. long), narrowly oblong, 3-nerved, cleft slightly over half way down into two linear acute erect lobes, no tooth in the sinus, midrib not excurrent, on each side near the base a long-spreading sulcate subulate papillose tooth (1.5 mm. long), between them a heavy fold: column very short, almost none.

Mossy woods and swamps, Labrador to New Jersey, westward to Michigan, Colorado, and California, northward to the Arctic coast; also in Greenland, Iceland, central and northern Europe and Japan (Blume).

The most widely distributed of all the species, but the specimens throughout this vast range are remarkably constant, and differ from each other only in size. A specimen in the Torrey herbarium is labeled as having been collected by Gray and Carey in the mountains of Virginia and South Carolina, July, 1841. The writer has seen no other specimen from farther south than New Jersey.

Specimens examined from Labrador (Hale), Newfoundland, Maine, New Hampshire, Vermont, New Jersey (Carey), Rhode Island, New York, Michigan, Colorado, Idaho, California, Oregon, Washington, British Columbia, Alaska, Greenland, Iceland, England, Lapland, Germany, France, Scandinavia, Switzerland.

4. *LISTERA AUSTRALIS* Lindley, Gen. et Sp. Orchid. 456. 1840.

*Listera cordata* Nutt. Gen. U. S. Pl. 2: 191. 1818.

*Listera convallarioides* Ell. Sketch, 2: 494. 1824.

Stem slender (12–22 cm. high), glabrous below, slightly red-glandular above the leaves; the latter inserted at or above the mid-

dle of the stem, small (in northern specimens 14–18 mm., in southern up to 25 mm. long), triangular-ovate, truncate or slightly cordate at the base, apiculate, primary veins three : raceme few- or many-flowered, open, rachis slender, slightly glandular : bracts minute, round-ovate, obtuse, very much shorter than the pedicels : flowers very small, on very slender glandular pedicels which equal or exceed the glabrous ovaries : petals short, oblong, recoiled : sepals round-ovate, minute, not over  $\frac{1}{4}$  the length of the lip : lip linear, long and slender (6–10 mm. long), cleft  $\frac{1}{3}$ – $\frac{2}{3}$  the way down into two nearly filiform acute lobes, sinus tooth small, provided on each side at the sessile base with a small incurved auricle, an inversely T-shaped fold near the base : column very short and thick (.5 mm. long).

Shady woods and sphagnous swamps, Florida (Chapman) and Louisiana to New Jersey ; also in Oswego County, N. Y., where it is confined entirely to the large peat bogs.

Some of Dr. Mellichamp's specimens show a tendency toward proliferation. Besides an increase in diameter of the stem many of the bracts are converted into leaves.

Specimens examined : Louisiana, New Orleans, Drummond (1832) ; South Carolina, Bluffton County, Mellichamp ; North Carolina, Curtis, Garber ; New York, Palermo, Oswego County, Wibbe, Sheldon, Rowlee ; New York, Baldwinsville, Beauchamp, Underwood.

5. *LISTERA OVATA* (L.) R. Br. Ait. Hort. Kew. 5 : 201. 1813.

*Ophrys ovata* L. Sp. Pl. 946. 1753.

*Epipactis ovata* Crantz. Stirp. Austr. ed. II., 473. 1769. Willd. Sp. Pl. 4 : 87. 1805.

*Neottia latifolia* Rich. Mem. Mus. Paris, 4 : 59. 1818.

Plant very large and stout (30–55 cm. high), glabrous below the leaves, densely pubescent above, with loose basal sheaths and several bracts below the raceme ; leaves borne below the middle of the stem, very large (7–12 cm. long), elliptic-oval, mucronate, many-nerved : raceme (15 cm. long), many-flowered, slender, but rather dense, very long peduncled : rachis pubescent : bracts of medium length, ovate, acuminate : flowers large, on short slightly glandular pedicels which equal the glabrous ovaries, and are scarcely longer than the bract : the ovate obtuse sepals and broadly linear petals both as long as the ovary ( $\frac{1}{2}$  length of lip) erect or spreading : lip large (10 mm. long), narrowly oblong-cuneate, sessile, without auricles or lateral teeth, cleft  $\frac{1}{3}$ – $\frac{1}{2}$  way down by a nar-

row sinus, lobes narrowly oblong obtuse, not ciliate; sinus tooth prominent; a longitudinal fold along the midrib: column very short and stout (1 mm. long).

Damp woods; central and northern Europe.

The largest of all species of *Listera*, and to a certain extent a transition to the group with longer columns.

Specimens examined: Scandinavia, Ahlberg; Alps, Reverchon; France, Germany.

#### 6. *Listera auriculata* sp. nov.

Stem slender (12–18 cm. high), glabrous below, glandular-pubescent above the leaves; bracts below the raceme absent: leaves large (35–50 mm. long), elliptic-oval or elliptic-ovate, acutish (rarely obtuse), inserted above the middle of the stem: raceme many-flowered but not dense: rachis pubescent: bracts not large, oblong-lanceolate, often obtuse, glabrous: flowers of medium size on stoutish glabrous pedicels which are mostly shorter than the glabrous ovaries, and scarcely exceed the bracts: sepals lance-ovate: petals oblong-linear, large ( $\frac{1}{2}$  length of lip), longer than the ovary, spreading, mostly obtuse: lip of medium size (6–8 mm. long), slightly ciliate, oblong, not dilated above, cleft  $\frac{1}{4}$ – $\frac{1}{3}$  the way down by a narrow sinus, not contracted at the base and without projecting teeth, more or less auriculate, the auricles incurved-clasping, a fold between the lateral veins near the base: column rather stout, of medium length (2.5 mm. long).

Cedar swamps and mossy banks, Quebec, New Hampshire and Maine.

Specimens examined: Quebec, Miss Percival (Torr. Herb.). Notre Dame du Lac, Quebec, Northrop, 1889 (Columb. Herb.). White Mountains, N. H., Mann (Cornell Herb.). Maine, Fort Kent, Furbish; Jerusalem, Fernald; Woodstock, Parlin.

#### 7. *LISTERA BOREALIS* Morong, Bull. Torr. Bot. Club, **20**: 31. 1893.

Plant small but not slender (7–15 cm. high), pubescent above the leaves, no bracts below the raceme: leaves very small (12–25 mm. long), elliptic-ovate, abruptly contracted at the base, obtuse at the apex and not mucronate, borne above the middle of the stem but one inserted slightly above the other: raceme few-flowered, open: rachis glandular-pubescent: bracts small, oblong, obtuse: flowers of medium size, on short rather stout glabrous pedicels, which equal the glabrous ovaries (3.5 mm. long), but are several times the length of the bract: the lanceolate sepals and ob-

long-linear petals, both large, obtuse ( $\frac{3}{4}$  length of the lip), longer than the ovary, spreading: lip short (7 mm. long), broadly oblong, deeply retuse at the apex, the sinus open, its tooth unusually large, lobes very obtuse but scarcely dilated, base sessile, expanded on each side into a large oblong divergent auricle (the latter  $1\frac{1}{2}$  mm. long,  $1\frac{1}{4}$  mm. wide), a fold extending between the lateral veins near the base, lip strongly ciliate and cellular-papillose toward the apex: column long (3 mm.), and rather stout, arcuate.

The long white hairs mentioned in the original description as borne in the inflorescence, although abundant on the type specimen, are almost entirely wanting on the other specimens, which suggests that they may be foreign bodies.

Rocky Mountains of Colorado, and northward to the Slave River British America.

Specimens examined: Colorado, Sawatch Range ("alpine") Brändegge. Rocky Mts., Drummond. Ft. Smith, Slave River, N. W. Ter., Miss E. Taylor (Columbia Herb., type). Ft. Simpson, Brit. Am. (Columbia Herb.).

8. *LISTERA CAURINA* Piper, *Erythea*, 6: 32. 1898.

*Listera convallarioides* Hooker Fl. Bor. Am. pl. 205. 1840.

Stem slender (12–30 cm. high), glabrous below, densely glandular-pubescent above the leaves, rarely a bract below the raceme, basal sheaths loose; leaves rather large (35–70 mm. long), oval to elliptic-ovate, thin, slightly apiculate or often acute, borne near the middle of the stem, bright green: raceme many-flowered, open: rachis pubescent: bracts 2–5 mm. long, rhombic-ovate, acuminate, often slightly glandular, the lower sometimes two-flowered and bifurcate: flowers small, the long slender glandular pedicels (4–6 mm. long) longer than the bracts and exceeding the ovaries; the latter glabrous: sepals and petals both lanceolate or linear-lanceolate, acutish,  $\frac{2}{3}$  the length of the lip, slightly longer than the ovary, spreading: lip rather small (5 mm. long), slightly declined, narrowly oblong, abruptly dilated and rounded above, not ciliate, retuse, mucron in the sinus blunt, provided at the sessile base with a very slender, almost filiform, ascending glabrous nerveless tooth on each side (1 mm. long), a papilla at the base of each tooth: column relatively short, not stout (1.5 mm. long).

Damp mossy woods, Oregon and Idaho to British Columbia. (Hooker). Occasionally one or two bracts are borne below the raceme.

Specimens examined: Oregon, near Mt. Hood, Howell (1875);

Spacious Bay, Gorman. Washington, Between Pend d' Oreille and Kootenai Rivers, Lyall (1861); Skamania Co., Suksdorf, no. 2326 (1894); Chehalis Co., Lamb, no. 129 (1897); Tacoma, Flett, no. 145 (1895); Cascade Mts., Henderson. Idaho, Latah Co., Piper.

9. *LISTERA CONVALLARIOIDES* (Swartz) Torr. Fl. N. U. S. 320. 1826.

*Epipactis convallarioides* Swartz, Vet. Acad. Handl. Stock. 21: 232. 1800. Willd. Sp. Pl. Pursh, Fl. Am. Sept.

*Listera Eschscholtziana* Cham. & Schl. Linnaea, 3: 33. 1828.

*Listera Banksiana* Lindl. Gen. et Sp. Orchid. 455. 1840.

Stem slender (12–20 cm. high), glabrous below, densely glandular-pubescent above the leaves, rarely with a bract below the raceme; leaves borne above the middle of the stem, rather large (30–50 mm. long), broadly oval, obtuse, very rarely apiculate, rounded at the base: raceme many-flowered, open: rachis densely glandular: bracts large (3–5 mm. long), rhombic-ovate, acute, often slightly glandular: flowers large, on very slender but rather short glandular pedicels which scarcely exceed the bracts and are slightly longer than the glandular ovary: the oblong-lanceolate sepals and narrowly linear petals both large (4.5–5 mm. long), longer than the ovary, reflexed, acutish: lip large (9 mm. long), narrowly cuneate, retuse, lobes rounded, minutely ciliate,  $\frac{1}{4}$  distance from the base provided with a very short triangular tooth on each side, and below these contracted into a stalk-like portion, without folds on the upper surface: column long and slender (3 mm. long), nearly straight.

In moist woods, Nova Scotia to Vermont, and from Michigan to California, northward to Alaska.

The Maine specimens have more elliptic leaves which are often acute.

Specimens examined: Nova Scotia, Macoun (1883) Nutt Mts.; New Brunswick, Fowler (1870), Bass River; Quebec, Allen (1881); Maine, Fernald (1893), nos. 102, etc.; New Hampshire, Oakes, Hitchcock; Vermont, Carey, Pringle, Eggleston; Michigan, Robbins, no. 154, Porter, Mann, Whiting, Atkinson; Wyoming, Nelson, no. 1694 (1895); Nevada, Watson, no. 1157 (1865); California, Plumas Co., Bolander, Ebbet Pass, Brewer, San Joaquin Riv. Muir, Lemmon; Oregon, Union, Cusick (1875), Howell, no. 724 (1887), Galton Mts., Lyall (1861); Washington,

Piper, Lamb; Idaho, Latah Co., Sandberg, no. 458, Quartzby, Mulford; Alaska, Gamisse; Behring Island, Macoun, no. 231 (1891).

10. *Listera Smallii* nom. nov.

*Listera reniformis* Small, Bull. Torr. Bot. Club, **24**: 334. 1897. Not of Don. Prod. Fl. Nep. 28. 1825.

Stem slender (15–30 cm. high), glandular-pubescent above the leaves, usually with one or two ovate-subulate bracts below the raceme; leaves borne at or below the middle of the stem, rather small (15–25 mm. long), ovate-reniform, mucronate, often apiculate: raceme few-flowered, open: rachis glandular: bracts small, narrowly rhombic-ovate, acute, glabrous: flowers large, on very slender glabrous pedicels which equal or exceed the glabrous ovary, twice as long as the bract: sepals lanceolate: petals lance-linear, acutish, longer than the ovary ( $\frac{1}{3}$  length of lip), spreading or reflexed: lip large (9 mm. long), not ciliate, broadly obovate and much dilated at the rounded apex, cleft  $\frac{1}{3}$ – $\frac{1}{2}$  way down by an open sinus, provided with a large and broad (1 mm. long) oblong or obovate, obtuse, 1-nerved, glabrous tooth on each side above the sessile base, many-nerved, folds wanting: column rather short (1.5 mm. long) and thick.

Damp woods, mountains of southern Pennsylvania, Maryland, Virginia, and North Carolina, also in Japan and the Amur region of Eastern Asia.

This is the American representative of the Asiatic group of species having reniform leaves. The specimens from Asia and Japan differ from the type in having much smaller flowers with the lip only  $\frac{1}{3}$  as long as the sepals, and may possibly represent a distinct species. When dissected the outline of the lip is almost exactly the same in both cases.

Specimens examined: Pennsylvania, Porter; Virginia and North Carolina, Gray and Carey (1841); Roan Mountains, Gray (1879); North Carolina, LeRoy and Ruger (1872), Curtiss, Beardslee and Kofoid (1891), Blowing Rock, Small and Heller, no. 251 (1891); Maryland, Gray (1843); Virginia, Britton and Vail (1892); Nix, Japan, Maximowicz (1864), Gray Herb. Distributed under the name *L. Japonica* Bl.; Amur Region, Maximowicz, labeled *L. Eschscholtziana* Cham. Gray Herb.



11. *LISTERA PUBERULA* Maxim. Bull. Acad. St. Petersburg. **29**: 204. 1883.

Plant very slender (12–20 cm. high), glandular-pubescent above the leaves; the latter inserted much below the middle of the stem, rather small (15–25 mm. long), deltoid-ovate, truncate or slightly cordate at the base, apex rounded or barely acute, the three primary veins strong: raceme few-flowered, open, on a very long (7–10 cm.) many-bracted peduncle: rachis very slender, pubescent: bracts rather small, subulate, acuminate: flowers very small, on slender glandular pedicels, the latter longer than the glabrous ovary and twice the length of the bract: petals and sepals linear, mostly obtuse,  $\frac{1}{3}$  the length of the lip, erect-spreading: lip small (7 mm. long), narrowly and regularly cuneate, without auricles or teeth toward the base, cleft  $\frac{1}{3}$  the way down, sinus narrow, lobes oblong, obtuse, not ciliate: column of medium length (1.5 mm.) stout, nearly straight.

In mossy woods, Province Kansu, western China, Pszewalski 1880 (according to Maximowicz); Nanokawa, Tosa, Japan (Watanabe, 1889).

The above description was drawn from the Japanese specimen.

12. *LISTERA PINETORUM* Lindl. Journ. Linn. Soc. **1**: 175. 1857.

Plant rather stout (10–15 mm. long), glandular-pubescent above the leaves; the latter of medium size (15 mm. long), inserted above the middle of the stem, broadly ovate, obtuse, acute, or even acuminate, truncate, the base many-nerved: raceme very short (3–6 cm. long) and few-flowered: rachis stout, glandular: bracts large (7–12 mm. long), lanceolate, acute, appressed: flowers very large, nearly sessile: ovary and pedicel nearly glabrous: sepals ovate-lanceolate, sulcate: petals linear, both acutish, spreading, one half as long as the lip: lip large (9 mm. long), obovate-cuneate, tapering to a narrow base, thickened along the midrib but with no distinct fold, without auricles or lateral teeth, cleft one third the way down by a very narrow sinus, lobes broad and rounded, not ciliate: column long (3 mm.), rather slender, arcuate.

In pine woods, Sikkim Himalayas, alt. 10000–12000 ft. (Hooker and Thomson).

The above description was drawn from a portion of the original material.

*Listera tenuis* Lindl. Jour. Linn. Soc. **1**: 176, 1857, from the original description seems not to be distinct from *L. pinetorum*.

The specimen labeled this in the Gray herbarium and collected in Sikkim by Hooker and Thomson is identical with the one labeled *L. pinetorum*.

#### Explanation of Plates 356, 357

Similar parts are drawn to the same scale, in all cases; *a*, entire plant; *b*, flower, side view; *c*, labellum as seen from above; *d*, column, side view.

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|-----------------------------------|--|
| 1. <i>Listera puberula</i> Maxim. | 6. <i>Listera convallarioides</i> (Swartz) Torr. |
| 2. " <i>auriculata</i> sp. nov.   | 7. " <i>Smallii</i> nom. nov.                    |
| 3. " <i>pinetorum</i> Lindl.      | 8. " <i>caurina</i> Piper.                       |
| 4. " <i>ovata</i> (L.) R. Br.     | 9. " <i>cordata</i> (L.) R. Br.                  |
| 5. " <i>borealis</i> Morong.      | 10. " <i>australis</i> Lindl.                    |

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